Remarks/Arguments:

1. Status of Claims

Claims 1-7, 9, 10 and 12-14 are pending. Claims 1-7, 9, 10 and 12-14 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (JP 62-81807) in view of Shibata et al. (U.S. 6,556,103).

2. Summary of Arguments

In the rejection of claims 1-7, 9, 10 and 12-14, the Examiner relies upon Suzuki and Shibata et al. On page 2 of the Office action, the Examiner acknowledges that Suzuki does not disclose or suggest Applicant's claimed features of "a ratio of a sum of a thickness (ts) of the first ... and the second dielectric film to the thickness (tp) of the piezoelectric plate is provided in a range such that an electro-mechanical coupling factor is substantially constant... the range of the ratio (ts/tp) is between 0.7 and 2.0, inclusive" (emphasis added). The Examiner asserts that Shibata et al. includes these claimed features to render the claimed invention obvious.

In the present rejection, however, there is an inoperable reference. Therefore, the cited reference does not make the claimed invention obvious. Specifically, Applicant refers to U.S. 6,556,103 to Shibata et al. This reference is inoperable and, thus, cannot be used to reject Applicant's claims. See MPEP § 2121 and also *In re Sasse*, 629F.2d 675, 207 USPQ 107 (CCPA 1980).

Shibata et al. is inoperable because it recites a three-layer vibrating section (with respect to Figs. 3 and 4), but cannot operate with three layers. In order for the piezoelectric resonator of Shibata et al. to operate, it has to include two layers. Accordingly, if the skilled person tried to create a piezoelectric resonator with three layers, using the disclosure of Shibata et al., the piezoelectric resonator would not work. As evidence of the inoperability of Shibata et al., Applicant respectfully submit that there is a translation error of the original Japanese language patent publication 2002-9579 (referred to herein as Shibata '579), that corresponds to priority application P2003-189125 (filed June 23, 2000). The translation error is described further below in Section 3.

Furthermore, Shibata et al. do not disclose or suggest a thickness ratio for a three-layer device in a range such that an electro-mechanical coupling factor is

substantially constant. As described further below in Section 3, Shibata et al., instead, describe a thickness ratio for a two-layer vibrating section to obtain a temperature coefficient of frequency (TCF) of zero.

3. Arguments

Claims 1-7, 9, 10 and 12-14 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (JP 62-81807) in view of Shibata et al. (U.S. 6,556,103). Applicant respectfully traverses this ground for rejection for the reasons set forth below.

Claim 1 includes features neither disclosed nor suggested by the cited art, namely:

> ...a ratio of a sum of a thickness (ts) of the first dielectric film and the second dielectric film to the thickness (tp) of the piezoelectric plate is provided in a range such that an electro-mechanical coupling factor is substantially constant ...
>
> ...the range of the ratio (ts/tp) is between 0.7 and 2.0, inclusive ...(emphasis added)

Claims 9 and 14 include similar recitations.

Suzuki discloses, in Figs. 1 and 2(e), a piezoelectric thin film resonator having an upper electrode 8 and a lower electrode 6. A dielectric film 5 is formed on lower electrode 6 and a dielectric film 9 is formed on an upper electrode 8 (Abstract). As acknowledged by the Examiner, Suzuki does not disclose or suggest "a ratio of a sum of a thickness (ts) of the first ... and the second dielectric film to the thickness (tp) of the piezoelectric plate is provided in a range such that an electro-mechanical coupling factor is substantially constant... the range of the ratio (ts/tp) is between 0.7 and 2.0, inclusive" (emphasis added). Accordingly, Suzuki does not include all of the features of claim 1.

Shibata et al. are inoperable and, thus, do not render the claimed invention obvious. On page 2, line 16-17 of the Office Action, the Examiner agrees that col. 12 of Shibata et al. teach a thickness ratio (ts/tp) of 0.55 that is not within Applicant's claimed range of "between 0.7 and 2.0, inclusive." However, on page 2, line 17 - page 3, line 5 of the Office Action, the Examiner asserts that col. 7, lines 48-56 of Shibata et al. refers to a thickness ratio 0.53 of one layer of SiO_2 film to the piezoelectric film. The Examiner asserts that the total thickness of the resonator section includes the piezoelectric element, two electrodes and two dielectric films (i.e. three layers), such that a thickness

ratio of two dielectric films to the piezoelectric element would be greater than 1.0. Applicant respectfully disagrees. Shibata et al. include a translation error that affects the operability of the disclosed piezoelectric vibrator.

Shibata et al. recite, at col. 7, lines 48-56:

> Also, in the piezoelectric resonator shown in Fig. 3 and Fig. 4, when the vibrating section 20 is constructed by a first layer including a piezoelectric body made of ZnO and a dielectric body made of SiO_2, and the thickness of the vibrating section, as a second layer structure, is about 2 μm and a ratio of film thickness (SiO_2 film thickness/ZnO film thickness) is about 0.53, a resonator having a resonance frequency temperature coefficient (TCF: Temperature Coefficient of frequency) of zero can be obtained.

The above-cited section discloses that "the vibrating section 20 is constructed by a first layer." The above-cited section also recites "the thickness of the vibrating section, as a second layer." Accordingly, Shibata et al. teach, in contradiction, that vibrating section 20 is a "first layer" and, also, a "second layer."

Based on col. 7. lines 48-56, Shibata et al. appear to describe a three-layer vibrating section, including two dielectric layers and a piezoelectric layer. However, what is alleged in Shibata et al. is not correct. As proof that the U.S. patent to Shibata et al. cannot operate as disclosed, a copy of the original Japanese language patent publication 2002-9579 (Shibata '579), that corresponds to priority application P2003-189125 (filed June 23, 2000) and a translation of paragraph [0019] are included.

In particular, paragraph [0019] of Shibata '579 illustrates a translation error in the U.S. patent to Shibata et al. A translation of paragraph [0019] of Shibata '579 recites:

> When the vibrating section 20, shown in Figs. 1 and 2, is constructed by ***a totally two-layer structure***, each layer being made of ***one layer of*** ZnO piezoelectric body and ***one layer of*** SiO_2 dielectric body, and total thickness of the vibrating section 20 is set to be about 2 μm, and a ratio of film thickness (SiO_2 film thickness/ZnO film thickness) is set to be about 0.53, a resonator having a resonance frequency temperature coefficient (TCF: Temperature Coefficient of frequency) of zero can be obtained. (Note that Figs. 1 and 2 of Shibata '579 correspond to Figs. 3 and 4 of the U.S. patent to Shibata et al.) (Emphasis Added)

Accordingly, in Shibata et al., the phrase "one layer" is mistakenly translated as "first layer." In addition, the phrase "two-layer structure" is mistakenly translated in Shibata et al. as "second layer structure." Thus, paragraph [0019] of Shibata '579 (and col. 7, lines 48-56 of the US patent to Shibata et al.) describes that when a "two-layer structure" of a resonator has a ratio of about 0.53, a resonator having a temperature coefficient of frequency (TCF) of zero can be obtained. However, Shibata et al. do not disclose a thickness ratio 0.53 for a three-layer structure. The thickness ratio 0.53 is disclosed for a two-layer structure to operate with a TCF of zero. Accordingly, if the skilled person tried to create a piezoelectric resonator with three layers, using the disclosure of Shibata et al., the piezoelectric resonator would not work. Thus, Shibata et al. cannot operate as alleged.

In addition, Shibata et al. describe, at col. 7, lines 48-56, a thickness ratio for a two-layer structure of about 0.53 so that a resonator having a temperature coefficient of frequency of zero can be obtained. Applicant notes that the feature of a temperature coefficient of frequency of zero is different from Applicant's claimed feature of a thickness ratio provided "in a range such that an electro-mechanical coupling factor is substantially constant"(emphasis added). For example, the Y-axis units in Fig. 2 of the subject invention (electro-mechanical coupling factor (%)) are different from the Y-axis units in Fig. 36 (temperature coefficient of frequency) of Shibata et al. In the subject invention, a mechanical coupling factor that is constant is desired, whereas in Shibata et al., a temperature coefficient of frequency of zero is desired. Accordingly, for the reasons set forth above, Shibata et al. is inoperable and cannot be used to reject Applicant's claims. Accordingly, allowance of claim 1 is respectfully requested.

Claims 2-7 include all of the features of claim 1 from which they depend. Accordingly, claims 2-7 are also patentable over the cited art.

Claims 9 and 14, although not identical to claim 1, includes features similar to claim 1 that are neither disclosed nor suggested by the cited art. Namely, that a ratio ts/tp of the first and second dielectric film thickness to the piezoelectric film thickness is provided in a range such that an electro-mechanical coupling factor is substantially constant, where the ratio ts/tp is between 0.7 and 2.0, inclusive. Accordingly, allowance of claims 9 and 14 is respectfully requested for at least the same reasons as for claim 1.

Claims 10, 12 and 13 include all of the features of claim 9 from which they depend. Accordingly, claims 10, 12 and 13 are also patentable over the cited art.

In view of the arguments set forth above, the above-identified application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,

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